Who Got the Brexit Blues? The effect of Brexit on subjective wellbeing in the UK

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December 2018

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Abstract

We use the 2015-2016 waves of the UK Household Longitudinal Study (Understanding Society) to look at subjective wellbeing around the time of the June 2016 EU membership Referendum in the UK (Brexit). We employ measures of both evaluative and affective wellbeing, namely life satisfaction and mental distress respectively. We find that those reporting lower life satisfaction in 2015 were more likely to express a preference for leaving the EU in 2016, while mental distress was less predictive of pro-Brexit attitudes. Post-Referendum, those with Leave preferences enjoyed an increase in life satisfaction but there was no change in average life satisfaction in the overall sample. In contrast, the average level of mental distress increased in the sample post-Brexit with no significant difference between those preferring to remain in or to leave the EU. We test the robustness of our results by considering a number of potential caveats, such as sample selection, unobserved individual fixed effects or the interval between interviews. Overall, our results suggest that levels of subjective wellbeing may both be a cause and a result of the 2016 Brexit vote.

Keywords: life satisfaction, mental distress, Brexit, United Kingdom, democracy .

JEL codes: I14, I30, I31.

1. Introduction

The Referendum on EU membership held in the UK on the 23rd of June 2016 yielded an outcome that the betting markets thought had only a 20% chance of occurring: A majority of voters in a record turnout (72.2%) voted for the UK to leave the EU (The Electoral Commission, 2017). The inability of pollsters and betting markets to anticipate this outcome first raises the question of whether there are additional indicators of voter preferences, and, second, whether this unexpected shock to long-run economic and social opportunities differentially affected groups of individuals in the UK. We here analyse Understanding Society panel data (UK Household Longitudinal Study, UKHLS) to identify which individuals expressed preferences for leaving the EU, and how the referendum outcome affected different groups, particularly in terms of life satisfaction.

Life satisfaction has previously been shown to be useful in predicting electoral outcomes, with Ward (2015) finding that, across 126 European elections since 1972, the life satisfaction of the population before an election had twice the predictive power for the share of votes for the incumbent political parties than that of GDP per capita. Liberini *et al*. (2017) equally show, using data from the UK BHPS 1996-2008, that low life satisfaction reduced the probability of voting for the government of the day, even when the lower levels of life satisfaction reflected events that were unlikely to be related to politics, such as the death of a spouse. They also uncover substantial differences in the baseline life satisfaction of voters of different parties, although this difference varies from election to election. Based on around 1,500 respondents in the 2000 American National Election Study, Flavin and Keane (2012) find that those with higher life satisfaction were substantially more likely to vote and participate politically: Moving from not very satisfied to completely satisfied increased the probability of voting by nearly seven percentage points.

We extend these previous contributions by looking at the determinants of the attitudes towards one specific question asked in a referendum – namely, the 2016 British referendum on EU membership. We then follow this up by attempting to estimate the effect of the Referendum outcome itself on individuals' subsequent subjective wellbeing (SWB) – and in particular their overall life satisfaction and usual level of mental distress. As such, we hope to be able to address some of the important questions regarding individual preferences for leaving the EU: Can SWB scores partly explain the differences in preferences for EU membership before the Referendum? What were the wellbeing differences between those preferring Remain or Leave following the Referendum result? Do the effects of Brexit on life satisfaction and mental health differ when people live in UK regions in which there are more people who share their preferences for EU membership?

We establish the wellbeing consequences of the EU Referendum by appealing to the same research design as in Metcalfe *et al*. (2011). For the study to be thought of as a quasi-experiment, the timing of the EU Referendum has to be largely randomly assigned in terms of the UKHLS interviews. Although the date of the EU Referendum was fixed, the dates on which individuals were interviewed in 2016 were independent of the EU Referendum (for a discussion of the sample design see Lynn, 2009; Buck and McFall, 2012). This enables us to conduct a pre-post comparison test of the EU Referendum result in order to see whether the change in average SWB from before to after the Referendum date of June 23rd 2016 was different for different groups of people.

In the UKHLS sample, we show that a one-year lag of life satisfaction is weakly associated with preferences for remaining in the EU. We find little evidence that life satisfaction and mental distress are statistically significantly different between people who reported a preference for remaining in the EU (Remainers) and those who reported a preference for leaving the EU (Leavers) **prior** to

the Referendum. However, we find a rise of approximately 0.1 points in the life satisfaction of those who expressed a preference for leaving the EU following the referendum. In addition, those who expressed a preference for remaining in the EU reported, on average, significantly lower mental wellbeing post the 2016 EU Referendum. Hence, there is some evidence that those who preferred leaving the EU became significantly more satisfied with their lives following the Brexit vote, while those who preferred to remain in the EU became worse off in terms of their usual mental state. Nevertheless, given that relatively more people wanted to leave than to remain in the EU in the days following the Referendum, it is possible that the post-Referendum increase in Leavers' wellbeing is merely a reflection of a shift in people's preferences as a result of knowing the Referendum outcome.

The remainder of the paper is organised as follows. Section 2 provides some background on the Brexit vote and the relevant subjective wellbeing literature. Section 3 describes the data and analytical method, while the results appear in Section 4. Last, Section 5 concludes.

2. Background

There is a dearth of literature on political participation, in the form of elections and referenda, and subjective wellbeing. Participation in referenda in Switzerland has been found to be positively associated with SWB (Frey and Stutzer, 2000), suggesting that individuals' sense of political autonomy and the process utility of expressing preferences may be good for their wellbeing, or, alternatively, that individuals tend to vote for policies that are wellbeing-enhancing.

However, referenda are relatively rare in the UK and the 2016 Referendum was only the second time that voters had been asked about EU membership, after a large majority of 67.2% of voters elected to remain in the European Community in 1975 (Saunders, 2016). Since that time, attitudes towards EU membership have been fairly volatile in the UK (Clarke, Goodwin and

Whiteley, 2017), culminating in the electorate's decision on June 23rd 2016 to leave the EU. This decision was however taken by a considerably smaller majority than that in the 1975 Referendum, with 51.9% voting Leave vs. 48.1% voting Remain. Researchers are still debating the reasons for the Leave votes, with some blaming the austerity policies that followed the 2008 financial crisis (Dorling, 2016), a cultural backlash against progressive value changes (Inglehart and Norris, 2016), missing information from the government about the economic consequences of Brexit (Welfens, 2016), or socio-economic background and identity politics (NatCen Social Research, 2016). It has also been argued that referenda provide an opportunity between regular elections for the electorate to express dissatisfaction with the incumbent government (Ryan, 2016), so that they become a protest vote (Kostadinova, 2017).

Overall, it appears that demographic background is a better predictor of Brexit voting decisions than are economic variables (Matti and Zhou, 2016). Post-Referendum analyses have suggested that those who were more likely to vote Leave were, on average, older, more likely to live in social housing, have no formal education and have lower incomes, and were less likely to belong to a minority (NatCen Social Research, 2016; O'Reilly *et al*., 2016). In our work here, we will add to this debate by investigating whether pre-Referendum subjective wellbeing significantly predicts preferences over EU membership. It is possible that protest voting in the Referendum is reflected in Leavers' lower subjective wellbeing scores prior to the Referendum date.

The main focus of our study is on the wellbeing consequences of the Brexit Referendum outcome. To this end, we ask whether the Referendum itself affected post-Referendum subjective wellbeing, and to what extent these wellbeing effects differ between those with preferences for Leave vs. Remain. We further investigate whether the Brexit wellbeing effects were moderated by the local percentage of those who voted in a way reflecting the respondent's

own preferences. This last moderating effect is along the lines of the social-norm effects of others' unemployment on the wellbeing of the unemployed in Clark (2003) and Powdthavee (2007).

Despite economists' predictions of the dire short- and long-term economic consequences of a winning Leave vote (e.g., Dhingra *et al*., 2016), aside from the sharp fall in the Pound, the predicted immediate economic recession has so far failed to appear (Johnson and Mitchell, 2017). Thus, any short-term impact of Brexit on SWB cannot be ascribed solely to sharp changes in economic circumstances. Regardless of macroeconomic conditions, individuals report higher levels of happiness when their preferred political party is in power (Di Tella and MacCulloch, 2005). Did those with a preference for Leave, who were the 'winners' of the EU Referendum, similarly experience increased SWB after the Referendum? We will explore this question below.

3. Methods

3.1. Data and variables

Our main dataset comes from Waves 7 and 8 of the UK Household Longitudinal Study (UKHLS; also known as Understanding Society). The data are early-release data which were made available to us by the survey institute following an application for early access (ISER, 2017). The Wave 8 sample contains only observations that were collected in 2016, and thus constitutes about 50% of the full Wave 8 dataset that will be released to researchers in the autumn of 2018 (the full dataset will also contain the 2017 data). We include respondents in our final sample who answered the question about EU membership preference. This produces an unbalanced, two-wave panel sample with 35,378 observations across two waves. However, not all respondents reported their SWB scores and there are also some missing observations for self-

rated health and household income. As we are comparing the same individuals across waves, and so do not use the full sample, we do not employ sampling weights. Some of our socio-demographic variables were only asked of respondents when they first joined the panel and are therefore derived from Waves 1-6 of the UKHLS.

We employ two outcome variables to assess pre- and post-Referendum wellbeing in the UK. The first is self-reported life satisfaction, which is a measure of a person's thoughts about his or her life. The exact wording of the life satisfaction is "*All things considered, how satisfied or dissatisfied are you with your life overall using a 1-7 scale? 1 = very dissatisfied, …, 7 = very satisfied*". The second wellbeing measure is derived from the General Health Questionnaire or GHQ-12 (Goldberg 1978). In the wellbeing literature, this scale is considered to be a good proxy for an individual's usual level of mental stress and strain. Respondents indicate on a 4-point scale, ranging from 1 (*Not at all*) to 4 (*Much more than usual*), how often over the last few weeks they: been able to concentrate, had lost sleep over worry, felt constantly under strain, felt they could not overcome difficulties, been feeling unhappy and depressed, been losing confidence, and been feeling like a worthless person. Individuals were also asked to indicate on a 4-point scale ranging from 1 (*More so than usual*) to 4 (*Much less than usual*) how often over the past few weeks they: had felt that they were playing a useful part in things, felt capable of making decisions, been able to enjoy day-to-day activities, been able to face up to problems, and been feeling reasonably happy. We use the Caseness score of the GHQ-12, which counts the number of times (out of 12) the individual selected a response that indicated poorer mental health. This is the SCGHQ2_DV variable in the UKHLS data, with a scale ranging from 0 (*best mental wellbeing*) to 12 (*worst mental wellbeing*). The life-satisfaction measure has been shown in the SWB literature to reflect the cognitive (or evaluative) dimension of wellbeing, as opposed to measures of affective wellbeing such as the GHQ-12 (see, e.g., Diener *et al*., 1985).

There is little indication in the existing literature as to which dimensions of SWB (between evaluative and affective wellbeing) should be affected more by the EU Referendum result. According to Kahneman and Deaton (2010), life evaluation – which, similar to life satisfaction, is an evaluative measure that relates more to one's life goals – has been found to be sensitive to individual socio-economic variables such as income and labour-force status. In contrast, measures of usual states of emotional wellbeing – an affective dimension of SWB that relates more to one's immediate or usual conditions and experiences – have been found to be sensitive to circumstances that evoke emotional responses, such as time spent commuting and caring for others. To the extent that the news of the Brexit result is more correlated with individual opportunities in life and long-term life goals, it will likely produce a significant change in life satisfaction, with the direction of the impact depending on whether the individual prefers to remain in or leave the EU. On the other hand, provided that the news does not affect the immediate or usual circumstances and experiences, we do not expect to observe a large correlation between the Brexit result and respondents' usual mental states.

Respondents were only asked about their preferences for EU membership in Wave 8 of the UKHLS, for which we have the responses that were collected between January and December 2016. More specifically, they were asked: "*Should the United Kingdom remain a member of the European Union or leave the European Union?*" It should be pointed out that the responses to this question do not indicate whether the respondent intended to vote in the EU Referendum or, for surveys collected after 23rd June 2016, whether they did actually vote in the Referendum, and, if so, whether their stated preference matched their actual vote. In our final Wave 8 sample, 51.9% of respondents expressed a preference for remaining in the EU, while 39.4% favoured Leave, 4.3% selected 'Don't know' and 4.4% refused to answer the question. Although the

UKHLS constitutes a representative sample of the UK population, these percentages do not match the actual Referendum outcome of 51.9% Leave vs. 48.1% Remain. It is possible that some UKHLS respondents did not vote in the actual Referendum or changed their minds between the date of the survey and the day of the Referendum. Unfortunately, we do not have information on whether respondents actually voted. However, it has been reported that voter turnout was higher in areas with greater support for the Leave campaign (Goodwin and Heath, 2016).

Our analysis further includes socio-demographic control variables that have previously been shown to be associated with SWB and at the same time are potential predictors of being selected into the treatment group, including gender, age, marital status, employment status, level of education, number of children and income (see Layard, Clark and Senik, 2012). As individuals may have been interviewed at different times and with different methods of data collection across these two waves, we also include the month of the interview in both waves, and the interview method (e.g., face-to-face, telephone, or online) as additional control variables. In an attempt to allow for any sharp changes in the economic sentiment post-Referendum, we account for daily exchange rates (GB£/US$) in each SWB regression, as well as monthly UK share-price indices[1], which are calculated from the prices of common shares of companies traded on national or foreign stock exchanges.

To best pick up socio-economic standing, our measure of income consists of respondents' average log monthly income over UKHLS Waves 1-6 (if available). The descriptive statistics for all measures are reported in Table 1A in the Appendix. The regional dummy variables are local authority districts (LADs). We matched the LADs in the dataset to the Referendum results

[1] The data on daily exchange rates and share price indices are obtained from www.investing.com website.

for each LAD published by the Electoral Commission (The Electoral Commission, 2017).[2] We use this information to construct a dummy variable indicating whether respondents live in an LAD in which the majority of voters at the time of the Referendum shared the preference for continued EU membership that the individual expressed in their UKHLS interview.

3.2. Econometric method

Our main equation to examine the pre-post comparison of the June 2016 Referendum focuses on the SWB of individual *i* at time *t* (SWB_{it}):

$$SWB_{it} = \alpha + \beta_1 PostEURef_i + \beta_2 Ref\ year_t + \beta_3 [PostEURef_i \times Ref\ year_t] + x_{it}\gamma + u_i + \varepsilon_{it}, \quad (1)$$

where $PostEURef_i$ is a dummy variable that takes the value of 1 if the individual was interviewed at least **one day** after the EU Referendum in Wave 8 of the UKHLS (i.e., from June 24th 2016 onwards), and 0 if the person was interviewed up to **one day** before the Referendum (i.e. from January 1st 2016 to June 22nd 2016); $Ref\ year$ is a dummy variable for being interviewed in Wave 8, i.e. in 2016, the year of the EU Referendum; x_{it} is a vector of control variables; u_i is the individual fixed effects; and ε_{it} denotes time-varying random shocks. The parameter β_1 thus captures the baseline difference in SWB (in Wave 7) between the people whose Wave 8 interview was before or after the 2016 EU Referendum; the parameter β_2 captures the wave effect (the average change in wellbeing between 2016 and 2015).

[2] The Referendum results for Northern Ireland were only published for Northern Ireland overall and not reported separately by LAD.

Our main assumptions are that the outcome of the Brexit vote was unknown, as well as largely unanticipated, prior to the Referendum date, and that in the absence of the EU Referendum SWB_{it} would have changed identically for the pre- and post-EU Referendum groups between Waves 7 and 8 – simply because the interview dates are randomised across individuals in each survey year (Lynn, 2009; Buck and McFall, 2012)[3]. The parameter β_3 will then represent the pre-post Brexit result differences in SWB of those interviewed in Wave 8 from June 23rd 2016 onward. More formally, in the absence of treatment, β_3 would be statistically insignificantly different from zero: in the absence of Brexit, pre- and post-EU Referendum SWB should be the same in Wave 8 of the UKHLS as it was in any other wave (Meyer, 1995). In this case, an unbiased estimator of β_3 can be obtained from pre-post difference as:

$$\hat{\beta}_3 = \Delta\overline{SWB}^{PostEURef}_{2016-2015} - \Delta\overline{SWB}^{PreEURef}_{2016-2015}$$
$$= \overline{SWB}^{PostEURef}_{2016} - \overline{SWB}^{PostEURef}_{2015} - (\overline{SWB}^{PreEURef}_{2016} - \overline{SWB}^{PreEURef}_{2015}). \quad (2)$$

Note that the fixed effects, u_i, are naturally cancelled out in this pre-post comparison specification.[4] We also dissect the pre-post estimate of the Brexit vote by individual preferences over EU membership (*Remain, Leave, Refusal, Don't Know, Missing*), captured in a vector Z_i' as followed:

$$SWB_{it} = \alpha + \beta_1 PostEURef_i + \beta_2 Ref\ year_t + \beta_3[PostEURef_i \times Ref\ year_t] +$$
$$\beta_4\ Z_i' + \beta_5\ [PostEURef_i \times Z_i'] + \beta_6\ [Ref\ year_t \times Z_i'] +$$
$$\beta_7\ [PostEURef_i \times Ref\ year_t \times Z_i'] + x_{it}\gamma + u_i + \varepsilon_{it}, \quad (3)$$

[3] Since the start of the UKHLS, fieldwork decisions led to moving interview dates for some households between months across different survey waves, although they always remained in the same quarter.

[4] However, it is possible that the OLS and fixed effects (FE) estimators of such model may be different in an unbalanced panel when there is time varying panel non-response (Lechner, Rodriguez-Planas and Fernández Kranz, 2016). We will return to the unbalanced vs. balanced panel estimates later in the paper.

where β_4' represents the baseline coefficient of individual EU preferences, β_5' the baseline differences in SWB by EU preferences for people interviewed post-EU Referendum in 2016, β_6' the coefficient of being interviewed in the Referendum year by EU preferences, and β_7' the pre-post Brexit vote difference in SWB by EU preferences for people who were interviewed from June 24rd 2016 onwards. Our hypothesis here is that the news of the Brexit result may have had a different pre-post outcome in terms of individual wellbeing, depending on whether the respondent favoured remaining in or leaving the EU. We vary the outcome variable in different specifications (life satisfaction and GHQ-12), and also perform separate analyses for different sub-groups. Note also that robust standard errors, clustered at the individual level, are reported in all tables.

4. Analyses

4.1. Main results

We start with the question: What predicts preferences for Brexit? To make a first pass at this question, we first estimate in Table 1 a probit regression with the dependent variable taking the value of 1 if the individual expressed a preference for Brexit (i.e., Leave the EU) and 0 otherwise. Our sample here consists of all individuals who answered this EU-preference question in Wave 8. While we control for many of the personal characteristics measured in Wave 8, our main independent variables of interest are the life satisfaction and mental stress the respondent reported in Wave 7.

This simple probit analysis is, of course, not causal. However, while the linear relationship between lagged life satisfaction and the individual's preference for Leave is only marginally significant (Column 1), the results in Column 2 suggest that particularly low life satisfaction in

year *t-1* (1-4 on the 1-7 scale) does predict preferences for Brexit in year *t*, even when controlling for income, job, other socio-economic characteristics, and regional fixed effects. This is consistent with recent work by Liberini *et al*. (2017) who also find evidence that unhappy feelings significantly contributed to Brexit in the UKHLS. On the other hand, lagged mental health does not appear to exert as strong an influence on an individual's preference for Brexit, holding lagged life satisfaction and other socio-economic status variables constant.

Though not reported in the table, the estimated coefficients on the other variables show that men are more likely than women to prefer leaving the EU. There is also a hump-shape in age in preferences for Brexit, although the age coefficients are not statistically significantly different from zero. Those who are married, cohabiting or divorced are statistically-significantly more likely to be pro-Brexit than the never married; the same holds for retirees, people with poor health and those with lower education. There is also evidence that those with higher long-term income, as measured by their average log monthly household income in the first six waves of the UKHLS, are significantly less likely to want to leave the EU. These estimates can be supplied on request.

Did the result of the EU Referendum then raise or lower average SWB in the UK in 2016? Columns 1 and 3 of Table 2 take a first look at this question by estimating Eq. (1) via OLS on self-reported life satisfaction and mental distress. In the life-satisfaction regression in Column 1, the estimated coefficient on the interaction between "Interviewed Post-EU Referendum" and "Referendum year" is negative, but very small and not statistically-significantly different from zero: the interaction coefficient is -0.06 with a robust standard error of 0.072. The Brexit referendum result did not seem to have had a significant average effect on life satisfaction for those who were interviewed from June 24th 2016 onwards. On the other contrary, the mental-distress regression in Column 3 reveals a notable rise in average mental stress following the EU

Referendum that is marginally statistically significant at the 10% level: here, the interaction coefficient is 0.285 with a robust standard error of 0.154. This is approximately 10% of the standard deviation in the mental distress scale.

The lack of an average pre-post difference in people's SWB does not mean that no-one was significantly affected by the Referendum outcome. It is plausible that the pre-post wellbeing differences vary by the respondent's own preference regarding the outcome. In order to test this formally, we introduce an interaction by EU-membership preference in the life-satisfaction equation, as in Eq. (2). The resulting estimates for life satisfaction and mental stress appear in Columns 2 and 4 of Table 2, respectively.

In this three-way interaction model, the interaction term between "Interviewed Post-EU Referendum" and "Referendum year" continues to be negative and statistically insignificant in the life satisfaction regression (Column 2). However, the same interaction term gains more statistical significance in the mental-distress regression (Column 4): the interaction coefficient is 0.331, with a robust standard error of 0.160. There is thus a statistically well-determined rise in the mental distress of those who preferred to remain in the EU following the Brexit vote in Wave 8.

The estimated coefficient on the interaction term between "Interviewed Post-EU Referendum" and "Preference for leaving the EU" is statistically insignificantly different from zero: prior to the EU Referendum, the life satisfaction and mental distress of those expressing a preference for Brexit was not statistically different to that of those expressing a preference to remain in the EU. Moreover, the baseline effect of "Interviewed Post-EU Referendum" is positive in the life-satisfaction regression and negative in the mental distress regression, but statistically

insignificantly different from zero, thus implying that there was no notable change in SWB levels – neither for life satisfaction nor mental distress – from before to after the Referendum date for those who preferred continued EU membership.

We now shift our attention to the estimated pre-post difference from the Brexit vote on the post-EU Referendum SWB among those who preferred Leave. Here, we can see from the 3-way interaction term between "Interviewed Post-EU Referendum", "Referendum year" and "Leave the EU" that the Brexit vote effect on the life satisfaction of people who preferred to leave the EU is positive and statistically well-determined: the 3-way interaction coefficient is 0.104, with a robust standard error of 0.048. On the other hand, the same 3-way interaction coefficient is negative but statistically insignificant in the mental-stress regression: the fall in average mental stress among those who preferred Brexit following the EU Referendum is not statistically significant.

In summary, the three-way interaction results suggest that there is a significant improvement in terms of evaluative wellbeing – as measured by life satisfaction – after the Referendum date for people who preferred to leave the EU compared to those who preferred to remain in the EU, while average mental distress rose post-Referendum for those who reported being anti-Brexit.

We conduct further analyses in Table 3 by introducing another moderating variable into the regression equation: a dummy variable that denotes whether the respondent lives in an area where the majority of Referendum voters shared their own EU preference (i.e. they "won"). This is to test the hypothesis that the wellbeing effect of the Brexit result is significantly moderated by whether or not the majority of other people in the area voted the same way.

Looking across the columns, we can still see that the Brexit effect on life satisfaction continues to be positive though only marginally significant for people who preferred leaving the EU, and that there is still a heightening of mental stress among people who preferred to remain in the EU post-Referendum. However, there is no evidence that the 3-way interaction term for either SWB measure is significantly moderated by living in an area where own EU preference won. There do not then seem to be social-context effects in the well-being consequences of the EU Referendum.

One question of interest is whether the Brexit effects for Leavers and Remainers appeared immediately following the Referendum result, and how long did they last? To answer, we look at the effects on SWB 0-2, 3-4, and 5 months or more after the Referendum. These new estimates appear in Table 4.

Instead of revealing a sharp and statistically-significant increase in life satisfaction among Leavers immediately following the Referendum, our results show that the positive Brexit vote effect only becomes statistically well-determined five months after the Referendum (Column 1 in Table 4). In addition, we document some evidence of a noticeable drop in the average life satisfaction of people who preferred to remain in the EU between two and four months after the Referendum; the interaction term between "Interviewed between 24/08/2016 and 23/10/2016" and "Year = 2016" is -0.233, with a robust standard error of 0.115. This estimated effect then becomes statistically insignificant five months after the Brexit vote.

With respect to mental stress, there is an immediate worsening for those who preferred to remain in the EU post-Referendum. The heightening of Remainers' average mental stress appears to be long-lasting and increases over time.

Finally, we conduct sub-sample analyses by gender and age groups, as shown in Table 5: it is men and the over-40s who preferred to leave the EU who derive the most satisfaction from the Brexit vote. In addition, we also find that women and the over-40s who preferred to remain in the EU report a significant increase in the usual level of mental stress following the EU Referendum.

4.2. Discussion

One concern is that because the question concerning support for Leave *versus* Remain is asked in only one wave (W8) spanning all of 2016, it is possible that people's attitudes may have already changed in consideration of the Referendum outcome. For example, post-Referendum, it may become significantly less stigmatising for people to admit that they prefer to leave the EU. Moreover, people may simply change their preferences from wanting to remain in the EU to wanting to leave the EU after the Brexit vote. In order to test whether there is selection into the treatment group (i.e. interviewed from June 24th 2016 onwards), we estimate in Appendix Table 2A a probit regression in which the dependent variable takes a value of 1 if the individual was interviewed after the Referendum date and 0 otherwise. Consistent with the idea that people may have changed their attitudes in consideration of the Referendum result, we find that significantly more people who preferred Brexit were interviewed post-Referendum than pre-Referendum. Unfortunately, little can be done to effectively solve this endogeneity issue, mainly because the announcement of the EU Referendum date was made by then-Prime Minister David Cameron only on February 20th 2016.[5] It is also the reason why we cannot call our pre-post estimates as difference-in-difference (DD) estimates as the outcome of the referendum affects both treatment and control groups. As a result, care must be taken when interpreting the effect of the Brexit vote

[5] The only viable solution to this problem is for us to travel back in time – possibly with a time-machine – so that the same "preference for EU" question could be posed to all individuals in 2015 (W7). Unfortunately, our combined research budget is simply not enough for us to build or hire one for this purpose.

on the wellbeing of people who expressed a preference for leaving the EU post-Referendum in that the positive effect of Brexit on Leavers' life satisfaction may simply be reflecting people's changes in preferences and attitudes towards leaving the EU. Nevertheless, it is also worth noting here that significantly fewer respondents reported to have no preference (the "*Don't know*" group) post-Referendum as well, which may reveal that admitting pro-Brexit preferences was more socially acceptable post-Referendum.

Second, the same treatment effect can probably still be observed had another date been used to generate the treatment group, i.e., one that is not the actual EU Referendum date of June 23rd 2016 (those in the treatment group were interviewed from June 24th 2016 onwards). We address this issue by conducting a number of placebo tests, the results of which appear in Appendix Table 3A. The first, in Columns 1 and 4 in Table 3A, uses June 24th 2015 as the cut-off date to generate the treatment group to be used on the sample from Waves 6 and 7. The second and third placebo tests, in Columns 2, 3, 5 and 6 in Table 3A, use June 24th 2016 to generate the treatment group, but apply it to two earlier samples – namely, a Waves 6 -7 sample and a Waves 5-6 sample. Across all of the columns, the estimated interaction terms, including the 3-way interaction coefficients, are small in size and statistically insignificant. This gives us some reassurance that the wellbeing effects from the Brexit vote that we observed post-Referendum in earlier tables are genuine and not due to chance.

Third, it might be argued that the unobserved individual fixed effects many continue to bias the estimates when an unbalanced panel is used in the estimation (Lechner, Rodriguez-Planas and Fernández Kranz, 2016). As a check, we re-estimate Eq.2 using both OLS and Fixed Effects (FE) estimators on a two-wave balanced panel and report the results in Appendix Table 4A. The balanced-panel OLS estimates here are qualitatively similar in terms of coefficient size and

statistical significance to those in the unbalanced panel (in Columns 2 and 4 of Table 2). Naturally, the FE coefficients are imprecisely estimated compared to those from OLS, yet they remain remarkably similar in terms of size and sign to the OLS estimates. We then conclude that attrition is ignorable for the pre-post estimation in our data.

Fourth, one objection to our results could be that the time intervals between waves are not constant across individuals. For example, people who were interviewed in September 2015 may have been re-interviewed again only in December 2016 instead of September 2016. According to the description of the UKHLS sample design (e.g., Lynn, 2009; Buck and McFall, 2012), a great deal of effort was taken by the survey institute to keep subsequent interviews within the same quarter. This seems to be the case when we take a closer look at the data: 37% of individuals in Wave 7 were re-interviewed in the same month in Wave 8 (e.g., in January 2015 and then in January 2016); 39% were re-interviewed in Wave 8 only one month away from their month of interview in Wave 7; and 12% were re-interviewed in Wave 8 only two months away from their Wave-7 interview month. In any case, the month of interview for both years is controlled for in all regressions. We are further able to show, in Appendix Table 5A, that qualitatively-similar results are obtained if we redefine the treatment group so that the cut-off date is June 24th 2016 for individuals interviewed in Wave 8, and June 24th 2015 for individuals interviewed in Wave 7.

Finally, one question of interest is in what specific way the EU Referendum result affected the mental health of people who preferred to remain in the EU. To answer this question, the GHQ-12 can be unpacked, with separate regressions run on each of its components. This should give us an idea of the principal conduits through which well-being fell. The results, in Appendix Table 6A, show that the Brexit Referendum result on Remainers' mental stress is positive and statistically

significant at the 5% level for six of the twelve GHQ-12 components, and thus works via a number of different routes, defying easy categorisation.

5. Conclusions

We analysed the SWB determinants of preferences for Brexit in the UK in 2016, as well as the subjective wellbeing effects of the outcome of the Referendum on EU membership held in June of that year. We found that those who reported lower levels of life satisfaction in 2015 were more likely to express preferences for Leave, while mental distress in 2015 was not as strong a predictor of pro-Brexit attitudes in 2016.

At the individual level, the referendum outcome produced a noticeable windfall satisfaction gain amongst Leavers compared to Remainers. At the level of the UK as a whole though, the effects of the Brexit vote on life satisfaction were statistically insignificant and close to zero. The average level of mental distress in our sample increased after the EU Referendum, though only by 0.1 of a standard deviation and only significant at the 10% level. In contrast to the results found for life satisfaction, the Brexit vote effect on mental health did not differ between Remainers and Leavers.

In conclusion, SWB does have some predictive power of people's preferences for Brexit, especially evaluative wellbeing which was assessed in the form of life satisfaction in our study. The life-satisfaction impact of the Referendum outcome differs significantly by the individual's stated EU membership preference, but this is not the case for mental distress. We have also repeated our analysis with the preliminary sampling weights supplied by the survey institute – See Table 7A in the Appendix -- and, subsequently, not all of our significant coefficients remained so. However, this may be due to the significant loss in the number of observations; we lose around

12,000 observations (or 67% of the whole sample) when the sampling weight is applied. It would be interesting to follow the subjective wellbeing trajectories of both Remainers and Leavers over a number of years to assess the potential long-term SWB consequences of this historic Referendum. Despite huge disappointment on the side of Remainers and elation on the side of Leavers, it is likely that the Brexit vote itself, in the end, will not permanently affect life satisfaction as the latter captures individuals' evaluations of many different domains of their lives (e.g. health, family, finances, etc.), many of which have not (yet) been affected by the Referendum result. However, with the date of EU withdrawal approaching fast, life satisfaction and mental distress may soon be affected by the real economic and social consequences that it will bring about.

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Table 1: Predicting preference for leaving the EU before the Referendum in 2016: Probit regressions

	Preference for Leave (=1)	
VARIABLES	**(1)**	**(2)**
Life satisfaction in 2015	-0.017*	
	(0.009)	
Mental distress: GHQ-12 in 2015	-0.008*	
	(0.005)	
High life satisfaction (5-7) in 2015		-0.095***
		(0.028)
High mental distress (10-12) in 2015		-0.003
		(0.062)
Regional dummies (14)	Yes	Yes
Pseudo R-squared	0.0593	0.0596
Observations	14,633	14,633

Notes: *<10%; **<5%; ***<1%. Dependent variable is derived from the question: "*Should the United Kingdom remain a member of the European Union or leave the European Union?" No=0; Yes=1*. Life satisfaction is derived from the question: *All things considered, how satisfied or dissatisfied are you with your life overall using a 1-7 scale?" 1 = very dissatisfied, …, 7 = very satisfied*. GHQ-12 is 0-12 scale of individual's usual level of mental distress, with a scale ranging from 0 (*best mental wellbeing*) to 12 (*worst mental wellbeing*). Other controls include gender, age, age-squared, age-cubed, marital status, employment status, self-rated health, highest completed education, average log monthly household income (waves 1-6), and number of children aged 16 and under. Sample taken from W8 before and after the EU Referendum date (23rd June 2016).

Table 2: Subjective wellbeing and the Brexit effect: Linear pre-post comparison regressions (UKHLS, 2015-2016): OLS regressions

	Life satisfaction		Mental distress	
VARIABLES	**OLS**	**OLS**	**OLS**	**OLS**
Interviewed post-EU Referendum in W8 (=1)	-0.014	0.002	0.001	-0.011
	(0.035)	(0.039)	(0.072)	(0.081)
Referendum year (=1)	-0.029	-0.021	0.002	-0.019
	(0.046)	(0.049)	(0.096)	(0.101)
Interviewed post-EU Ref in W8 × Ref year	**-0.060**	**-0.115**	**0.285***	**0.331****
	(0.072)	**(0.075)**	**(0.154)**	**(0.160)**
Preference towards EU				
Leave the EU	-0.012	-0.023	-0.089**	-0.100
	(0.017)	(0.032)	(0.036)	(0.067)
Don't know	0.052	0.042	-0.191**	-0.255**
	(0.040)	(0.060)	(0.084)	(0.117)
Refusal/missing	-0.031	0.022	-0.144	-0.058
	(0.051)	(0.076)	(0.104)	(0.169)
2-way interaction terms				
Post-EU Ref × Leave the EU		-0.027		0.017
		(0.042)		(0.085)
Post-EU Ref × Don't know		-0.026		0.176
		(0.109)		(0.237)
Post-EU Ref × Refusal/missing		-0.096		-0.013
		(0.109)		(0.109)
Ref year × Leave the EU		-0.005		0.044
		(0.036)		(0.073)
Ref year × Don't know		-0.011		0.054
		(0.067)		(0.130)
Ref year x Refusal/missing		-0.183		0.036
		(0.122)		(0.257)
3-way interaction terms				
Post-EU Ref × Ref year × Leave the EU		**0.104****		**-0.074**
		(0.048)		**(0.098)**
Post-EU Ref × Ref year × Don't know		0.146		-0.079
		(0.132)		(0.277)
Post-EU Ref × Ref year × Refusal/missing		0.321*		-0.523
		(0.178)		(0.362)
Observations	35,378	35,378	35,289	35,289
R-squared	0.189	0.189	0.179	0.179

Notes: *<10%; **<5%; ***<1%. Robust standard errors reported in parentheses. See Table 1's note for a discussion on life satisfaction and mental distress. Control variables include gender, age, age-squared, age-cubed, employment, education, marital status, average of log monthly income (W1-6), number of children, daily exchange rate (£/US$), monthly share prices, month of the interview, interview mode dummies (i.e., face-to-face, telephone or online) and regional fixed effects. No sampling weight was used in the regression.

Table 3: Does living in an area where own EU preference achieved a majority reinforce or mitigate the Brexit SWB effect? OLS regressions

VARIABLES	Life satisfaction	Mental distress
Living in an area where own EU preference won	-0.018	0.056
	(0.043)	(0.091)
2-way interaction terms		
Post-EU Ref × Ref year	**-0.109**	**0.385****
	(0.082)	**(0.176)**
3-way interaction terms		
Post-EU Ref × Ref year × Leave the EU	**0.153***	**-0.044**
	(0.080)	**(0.161)**
Post-EU Ref × Ref year × Living in an area where own EU preference won	0.022	-0.135
	(0.064)	(0.132)
4-way interaction terms		
Post-EU Ref × Ref year × Leave the EU × Living in an area where own EU preference won	**-0.088**	**0.039**
	(0.103)	**(0.209)**
Main and interaction effects as in Table 2's Column 2 included	Yes	Yes
Observations	31,497	31,423
R-squared	0.186	0.177

Notes: *<10%; **<5%; ***<1%. Robust standard errors – clustered at the personal identification level – are reported in parentheses. The control variables are the same as in Table 2.

Table 4: Was the Brexit effect immediate and long-lasting? OLS regressions

VARIABLES	Life satisfaction	Mental distress
Interviewed between 24/06/2016 and 23/08/2016	-0.013	0.001
	(0.046)	(0.093)
Interviewed between 24/08/2016 and 23/10/2016	0.078	0.048
	(0.051)	(0.109)
Interviewed after 23/10/2016	0.070	-0.234**
	(0.055)	(0.114)
Referendum year (=1)	0.041	-0.160
	(0.056)	(0.118)
Btw 24/06/2016 and 23/08/2016 × Ref Year	**-0.103**	**0.393****
	(0.089)	**(0.181)**
Btw 24/08/2016 and 23/10/2016 × Ref Year	**-0.233****	**0.480****
	(0.115)	**(0.238)**
After 23/10/2016 × Ref Year	**-0.192**	**0.533****
	(0.124)	**(0.254)**
Preference towards EU		
Leave the EU	-0.024	-0.099
	(0.032)	(0.067)
2-way interaction terms		
Btw 24/06/2016 and 23/08/2016 × Leave the EU	-0.045	0.057
	(0.060)	(0.120)
Btw 24/08/2016 and 23/10/2016 × Leave the EU	-0.013	-0.093
	(0.057)	(0.119)
After 24/10/2016 × Leave the EU	-0.027	0.069
	(0.054)	(0.108)
Ref year × Leave the EU	-0.005	0.044
	(0.036)	(0.073)
3-way interaction terms		
Btw 24/06/2016 and 23/08/2016 × Ref year × Leave the EU	**0.069**	**-0.099**
	(0.067)	**(0.132)**
Btw 24/08/2016 and 23/10/2016 × Ref year × Leave the EU	**0.096**	**-0.025**
	(0.065)	**(0.135)**
After 24/10/2016 × Ref year × Leave the EU	**0.148****	**-0.153**
	(0.068)	**(0.137)**
Observations	35,260	35,171
R-squared	0.189	0.180

Notes: *<10%; **<5%; ***<1%. Robust standard errors – clustered at the personal identification level – are reported in parentheses. The control variables are the same as in Table 2.

Table 5: Sub-sample analysis: Men versus Women and Young versus Old: OLS regressions

	Life satisfaction				Mental distress			
VARIABLES	**Men**	**Women**	**Young (age<=40)**	**Old (age>40)**	**Men**	**Women**	**Young (age<=40)**	**Old (age>40)**
Post-EU Ref in W8	-0.014	0.017	0.011	-0.009	0.029	-0.031	0.026	-0.028
	(0.059)	(0.053)	(0.064)	(0.050)	(0.113)	(0.113)	(0.136)	(0.100)
Referendum year	-0.006	-0.028	-0.061	0.008	-0.067	0.027	-0.189	0.058
	(0.074)	(0.065)	(0.082)	(0.060)	(0.141)	(0.143)	(0.178)	(0.123)
Post-EU Ref in W8 × Referendum year	**-0.026**	**-0.190***	**-0.167**	**-0.089**	**0.039**	**0.557****	**0.331**	**0.329***
	(0.109)	**(0.103)**	**(0.129)**	**(0.093)**	**(0.223)**	**(0.227)**	**(0.282)**	**(0.194)**
Preference towards EU								
Leave the EU	-0.010	-0.032	-0.093	-0.000	-0.123	-0.083	0.041	-0.131*
	(0.047)	(0.044)	(0.060)	(0.038)	(0.091)	(0.096)	(0.132)	(0.078)
2-way interaction terms								
Post-EU Ref × Leave the EU	-0.027	-0.030	0.096	-0.064	-0.016	0.045	-0.225	0.083
	(0.061)	(0.057)	(0.077)	(0.050)	(0.117)	(0.123)	(0.168)	(0.100)
Ref year × Leave the EU	-0.026	0.011	-0.039	-0.005	0.131	-0.029	-0.062	0.073
	(0.053)	(0.050)	(0.068)	(0.043)	(0.099)	(0.107)	(0.150)	(0.086)
3-way interaction terms								
Post-EU Ref × Ref year × Leave the EU	**0.137***	**0.078**	**0.071**	**0.117****	**-0.160**	**-0.005**	**0.094**	**-0.125**
	(0.071)	**(0.066)**	**(0.090)**	**(0.058)**	**(0.134)**	**(0.142)**	**(0.199)**	**(0.114)**
Observations	15,639	19,739	10,500	24,878	15,597	19,692	10,467	24,822
R-squared	0.180	0.200	0.197	0.190	0.158	0.189	0.162	0.189

Notes: *<10%; **<5%; ***<1%. Robust standard errors – clustered at the personal identification level – are reported in parentheses. The control variables are the same as in Table 2.

Appendix

Table 1A: Descriptive statistics, by wave

	Wave 7 (2015)					Wave 8 (2016)				
Variable	**Obs**	**Mean**	**Std.**	**Min**	**Max**	**Obs**	**Mean**	**Std.**	**Min**	**Max**
Life satisfaction	18,064	5.298	1.421	1	7	18,114	5.256	1.437	1	7
Mental distress (GHQ-12: Caseness)	18,682	1.651	2.959	0	12	18,682	1.667	2.963	0	12
Male	18,682	0.441	0.497	0	1	18,682	0.441	0.497	0	1
Age	18,682	50.685	18.260	16	101	18,682	51.679	18.266	16	102
Marital status										
Single and never married/in civil partnership	18,682	0.194	0.396	0	1	18,682	0.192	0.394	0	1
Married	18,682	0.544	0.498	0	1	18,682	0.547	0.498	0	1
In a registered same-sex civil partnership	18,682	0.004	0.061	0	1	18,682	0.004	0.062	0	1
Separated but legally married	18,682	0.015	0.121	0	1	18,682	0.014	0.116	0	1
Divorced	18,682	0.067	0.251	0	1	18,682	0.068	0.252	0	1
Widowed	18,682	0.068	0.251	0	1	18,682	0.070	0.256	0	1
Separated from civil partner	18,682	0.000	0.007	0	1	18,682	0.000	0.021	0	1
A former civil partner	18,682	0.000	0.007	0	1	18,682	0.000	0.010	0	1
A surviving civil partner	18,682	0.000	0.007	0	1	18,682	0.000	0.010	0	1
Living as couple	18,682	0.107	0.309	0	1	18,682	0.103	0.304	0	1
Not reported	18,682	0.001	0.031	0	1	18,682	0.001	0.031	0	1
Employment status										
In paid employment (full or part-time)	18,682	0.475	0.499	0	1	18,682	0.473	0.499	0	1
Self employed	18,682	0.073	0.261	0	1	18,682	0.076	0.266	0	1
Unemployed	18,682	0.035	0.184	0	1	18,682	0.033	0.178	0	1
Retired	18,682	0.280	0.449	0	1	18,682	0.293	0.455	0	1
On maternity leave	18,682	0.005	0.072	0	1	18,682	0.004	0.063	0	1
Looking after family or home	18,682	0.042	0.200	0	1	18,682	0.041	0.197	0	1
Full-time student	18,682	0.051	0.219	0	1	18,682	0.038	0.191	0	1
Long-term sick or disabled	18,682	0.033	0.178	0	1	18,682	0.035	0.185	0	1
On a government training scheme	18,682	0.001	0.024	0	1	18,682	0.000	0.013	0	1
Unpaid worker in family business	18,682	0.001	0.026	0	1	18,682	0.001	0.023	0	1
Working in an apprenticeship	18,682	0.001	0.037	0	1	18,682	0.001	0.038	0	1
Doing something else	18,682	0.004	0.065	0	1	18,682	0.004	0.066	0	1
Not reported	18,682	0.000	0.016	0	1	18,682	0.000	0.019	0	1
Self-rated health	18,081	3.392	1.060	1	5	18,141	3.318	1.067	1	5
Obtained A-levels	18,682	0.159	0.366	0	1	18,682	0.161	0.368	0	1
Obtained a first degree	18,682	0.186	0.389	0	1	18,682	0.188	0.391	0	1
Log of household income	18,189	7.795	0.582	-0.517	9.903	18,189	7.795	0.582	-0.517	9.903

Number of own children in household	18,682	0.459	0.883	0	8	18,682	0.453	0.876	0	7

Table 2A: Predicting selection to be interviewed post-EU Referendum in 2016: Probit regression

VARIABLES	Interviewed post-EU Referendum in 2016
Preferences towards the EU	
Leave the EU	0.113***
	(0.022)
Don't know	-0.665***
	(0.051)
Refused/missing	0.018
	(0.075)
Ratio of people who prefer to leave in the area	0.000
	(0.001)
Male	-0.038*
	(0.020)
Age	-0.019
	(0.015)
Age-squared/100	0.022
	(0.029)
Age-cubed/10,000	-0.012
	(0.018)
Married	-0.055
	(0.036)
Same-sex civil partnership	-0.237*
	(0.143)
Separated	-0.037
	(0.085)
Divorced	-0.057
	(0.050)
Widowed	0.003
	(0.057)
Separated from civil partner	0.051
	(0.376)
A surviving civil partner	0.084
	(0.881)
Living as couple	-0.019
	(0.927)
Self-employed	0.056
	(0.038)
Unemployed	0.018
	(0.057)
Retired	-0.021
	(0.041)
On maternity leave	0.015
	(0.152)
Looking after family or home	0.039
	(0.054)
Full-time student	-0.228***

	(0.069)
Long-term sick or disabled	-0.005
	(0.063)
On a government training scheme	0.067
	(0.695)
Unpaid worker in family business	0.350
	(0.443)
Working in an apprenticeship	-0.138
	(0.262)
Doing something else	-0.042
	(0.141)
Health: fair	-0.006
	(0.050)
Health: good	0.038
	(0.049)
Health: very good	0.086*
	(0.049)
Health: excellent	0.074
	(0.054)
Highest education: A-level	0.067**
	(0.028)
Highest education: first degree or over	0.010
	(0.027)
Log of monthly household income	-0.008
	(0.020)
Number of children age<16	0.011
	(0.014)
Region: North West	-0.146**
	(0.061)
Region: Yorkshire and the Humberside	-0.078
	(0.063)
Region: East Midlands	-0.040
	(0.064)
Region: West Midlands	-0.025
	(0.063)
Region: East of England	-0.098
	(0.062)
Region: London	0.023
	(0.066)
Region: South East	0.003
	(0.060)
Region: South West	-0.006
	(0.062)
Region: Wales	-0.000
	(0.062)
Region: Scotland	-0.062
	(0.066)
Region: Northern Ireland	0.040
	(0.063)
Pseudo R-squared	0.014

Observations	16,516

Notes: *<10%; **<5%; ***<1%. Robust standard errors – clustered at the local area district – are reported in parentheses.

Table 3A: Placebo tests

	Life satisfaction			Mental distress		
VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Interviewed after 23/06/15 (i.e. Placebo treatment)	-0.002			-0.025		
	(0.034)			(0.070)		
Interviewed post-EU Referendum in W8 (=1)		-0.017	-0.017		0.010	-0.040
		(0.032)	(0.033)		(0.065)	(0.068)
Base year = 2014						
Year = 2015	0.055**	0.061**		-0.106**	-0.080*	
	(0.025)	(0.024)		(0.050)	(0.048)	
Base year = 2013			0.126***			-0.129**
Year = 2014			(0.025)			(0.051)
Placebo treatment × Year = 2015	**0.022**			**0.028**		
	(0.032)			**(0.066)**		
Post-EU Ref × Year = 2015		**0.026**			**-0.004**	
		(0.032)			**(0.064)**	
Post-EU Ref × Year = 2014			**-0.009**			**0.095**
			(0.034)			**(0.068)**
Preference towards EU						
Leave the EU	-0.042	-0.041	-0.129***	-0.108	-0.045	0.149**
	(0.035)	(0.033)	(0.036)	(0.070)	(0.066)	(0.075)
2-way interaction terms						
Placebo treatment × Leave the EU	0.034			0.007		
	(0.044)			(0.088)		
Post-EU Ref × Leave the EU	0.038	0.076		-0.057	-0.124	
	(0.043)	(0.046)		(0.085)	(0.095)	
Year = 2015 × Leave the EU	0.024	0.017		-0.030	-0.040	
	(0.039)	(0.038)		(0.076)	(0.074)	
Year = 2014 × Leave the EU			0.093**			-0.191**
			(0.040)			(0.079)

3-way interaction terms						
Placebo treatment × Year=2015 × Leave the EU	**-0.062**			**0.097**		
	(0.051)			**(0.098)**		
Post-EU Ref × Year = 2015 × Leave the EU		**-0.059**			**0.075**	
		(0.050)			**(0.096)**	
Post-EU Ref × Year = 2014 × Leave the EU			**-0.039**			**0.069**
			(0.053)			**(0.102)**
Observations	34,140	35,268	34,220	34,032	35,153	34,140
R-squared	0.156	0.155	0.142	0.166	0.167	0.156

Notes: *<10%; **<5%; ***<1%. Robust standard errors – clustered at the personal identification level - are reported in parentheses. Control variables are the same as in Table 2.

Table 4A: Balanced panel: OLS and FE regressions

	Life satisfaction		Mental distress	
VARIABLES	**OLS**	**FE**	**OLS**	**FE**
Interviewed post-EU Referendum in W8 (=1)	0.007		-0.021	
	(0.039)		(0.081)	
Referendum year (=1)	0.005	-0.063	-0.039	0.040
	(0.049)	(0.066)	(0.102)	(0.133)
Interviewed post-EU Ref in W8 × Ref year	**-0.118**	**-0.084**	**0.332****	**0.284***
	(0.078)	**(0.081)**	**(0.163)**	**(0.168)**
Preference towards EU				
Leave the EU	-0.023		-0.098	
	(0.032)		(0.067)	
Don't know	0.041		-0.252**	
	(0.059)		(0.117)	
Refusal/missing	0.023		-0.060	
	(0.076)		(0.169)	
2-way interaction terms				
Post-EU Ref × Leave the EU	-0.027		0.017	
	(0.042)		(0.085)	
Post-EU Ref × Don't know	-0.025		0.172	
	(0.109)		(0.237)	
Post-EU Ref × Refusal/missing	-0.098		-0.011	
	(0.109)		(0.228)	
Ref year × Leave the EU	0.012	0.004	0.036	0.040
	(0.036)	(0.036)	(0.074)	(0.074)
Ref year × Don't know	-0.034	-0.054	0.102	0.084
	(0.068)	(0.067)	(0.133)	(0.131)
Ref year x Refusal/missing	-0.110	-0.127	0.028	0.026
	(0.122)	(0.121)	(0.256)	(0.256)
3-way interaction terms				
Post-EU Ref × Ref year × Leave the EU	**0.084***	**0.061**	**-0.084**	**-0.051**
	(0.048)	**(0.048)**	**(0.099)**	**(0.098)**
Post-EU Ref × Ref year × Don't know	0.196	0.260*	-0.158	-0.051
	(0.132)	(0.134)	(0.278)	(0.283)
Post-EU Ref × Ref year × Refusal/missing	0.197	0.218	-0.508	-0.232
	(0.182)	(0.198)	(0.370)	(0.380)
Observations	33,822	33,822	33,737	33,737
R-squared	0.188		0.178	
Within R-squared		0.020		0.034

Notes: *<10%; **<5%; ***<1%. Robust standard errors – clustered at the personal identification level - are reported in parentheses. Control variables are the same as in Table 2.

Table 5A: Redefining the treatment group

	Life satisfaction		Mental distress	
VARIABLES	**OLS**	**FE**	**OLS**	**FE**
Interviewed after 23/06 in the survey year (=1)	-0.002	-0.140*	0.177	-0.026
	(0.057)	(0.076)	(0.118)	(0.168)
Referendum year (=1)	-0.023	-0.113	0.121	0.056
	(0.056)	(0.069)	(0.118)	(0.142)
Interviewed post-EU Ref in W8 × Ref year	**-0.112**	**0.002**	**0.180**	**0.250**
	(0.082)	**(0.093)**	**(0.174)**	**(0.191)**
Preference towards EU				
Leave the EU	-0.019		-0.154**	
	(0.033)		(0.068)	
Don't know	0.016		-0.182	
	(0.062)		(0.122)	
Refusal/missing	-0.034		-0.032	
	(0.082)		(0.182)	
2-way interaction terms				
Interviewed after 23/06 × Leave the EU	-0.033	-0.023	0.104	0.202
	(0.042)	(0.081)	(0.086)	(0.165)
Interviewed after 23/06 × Don't know	0.055	0.314	-0.068	0.003
	(0.104)	(0.219)	(0.223)	(0.383)
Interviewed after 23/06 × Refusal/missing	0.005	0.368	-0.051	1.140**
	(0.111)	(0.294)	(0.232)	(0.522)
Ref year × Leave the EU	-0.009	0.001	0.097	0.067
	(0.038)	(0.038)	(0.076)	(0.077)
Ref year × Don't know	0.015	-0.026	-0.020	0.089
	(0.070)	(0.070)	(0.135)	(0.135)
Ref year x Refusal/missing	-0.127	-0.049	0.011	0.276
	(0.127)	(0.139)	(0.266)	(0.306)
3-way interaction terms				
Interviewed after 23/06 × Ref year × Leave the EU	**0.109****	**0.065**	**-0.161**	**-0.092**
	(0.050)	**(0.051)**	**(0.103)**	**(0.104)**
Interviewed after 23/06 × Ref year × Don't know	0.065	0.195	0.169	-0.052
	(0.131)	(0.137)	(0.288)	(0.300)
Interviewed after 23/06 × Ref year × Refusal/missing	0.220	0.117	-0.484	-0.564
	(0.184)	(0.212)	(0.377)	(0.421)
Observations	35,378	35,378	35,289	35,289
R-squared	0.189		0.179	
Within R-squared		0.021		0.034

Notes: *<10%; **<5%; ***<1%. Robust standard errors – clustered at the personal identification level - are reported in parentheses. Control variables are the same as in Table 2.

Table 6A: Unpacked mental-stress regressions

	GHQA	**GHQB**	**GHQC**	**GHQD**
Interviewed post-EU Ref in W8 × Ref year	0.032	0.075*	0.030	0.049**
	(0.029)	(0.043)	(0.031)	(0.025)
Post-EU Ref × Ref year × Leave the EU	-0.029	-0.013	-0.012	-0.015
	(0.019)	(0.026)	(0.020)	(0.017)
	GHQE	**GHQF**	**GHQG**	**GHQH**
Interviewed post-EU Ref in W8 × Ref year	0.130***	0.087**	0.003	0.039
	(0.041)	(0.039)	(0.031)	(0.027)
Post-EU Ref × Ref year × Leave the EU	-0.041	0.004	-0.004	-0.004
	(0.026)	(0.026)	(0.020)	(0.017)
	GHQI	**GHQJ**	**GHQK**	**GHQL**
Interviewed post-EU Ref in W8 × Ref year	0.107**	0.102**	0.078**	0.031
	(0.043)	(0.041)	(0.037)	(0.031)
Post-EU Ref × Ref year × Leave the EU	-0.035	0.013	0.007	0.003
	(0.027)	(0.026)	(0.022)	(0.021)

Notes: *<10%; **<5%; ***<1%. Robust standard errors – clustered at the personal identification level - are reported in parentheses. Control variables are the same as in Table 2. GHQA = concentration; GHQB = loss of sleep; GHQC = playing a useful role; GHQD = capable of making decisions; GHQE = constantly under strain; GHQF = problem overcoming difficulties; GHQG = enjoy day-to-day activities; GHQH = ability to face problems; GHQI = unhappy or depressed; GHQJ = losing confidence; GHQK = believe worthless; GHQL = general happiness.

Table 7A: Subjective wellbeing and the Brexit effect: Linear pre-post comparison regressions (UKHLS, 2015-2016): Applying sampling weight

	Life satisfaction	Mental distress
VARIABLES	**OLS**	**OLS**
Interviewed post-EU Referendum in W8 (=1)	-0.011	0.013
	(0.062)	(0.124)
Referendum year (=1)	0.074	-0.057
	(0.073)	(0.153)
Interviewed post-EU Ref in W8 × Ref year	**-0.225****	**0.539****
	(0.111)	**(0.248)**
Preference towards EU		
Leave the EU	-0.085*	-0.068
	(0.045)	(0.097)
Don't know	-0.004	-0.313**
	(0.086)	(0.158)
Refusal/missing	-0.053	0.016
	(0.123)	(0.267)
2-way interaction terms		
Post-EU Ref × Leave the EU	0.062	-0.039
	(0.059)	(0.124)
Post-EU Ref × Don't know	0.091	0.160
	(0.165)	(0.320)
Post-EU Ref × Refusal/missing	0.000	0.035
	(0.161)	(0.379)
Ref year × Leave the EU	0.026	0.058
	(0.051)	(0.107)
Ref year × Don't know	0.015	0.106
	(0.089)	(0.166)
Ref year x Refusal/missing	-0.167	0.092
	(0.162)	(0.373)
3-way interaction terms		
Post-EU Ref × Ref year × Leave the EU	**0.050**	**-0.189**
	(0.068)	**(0.144)**
Post-EU Ref × Ref year × Don't know	0.309*	-0.543
	(0.167)	(0.417)
Post-EU Ref × Ref year × Refusal/missing	0.344	-0.790
	(0.225)	(0.566)
Observations	23,746	23,682
R-squared	0.187	0.169

Notes: *<10%; **<5%; ***<1%. Robust standard errors reported in parentheses. Control variables include gender, age, age-squared, age-cubed, employment, education, marital status, average of log monthly income (W1-6), number of children, daily exchange rate (£/US$), monthly share prices, month of the interview, interview mode dummies (i.e., face-to-face, telephone or online) and regional fixed effects.